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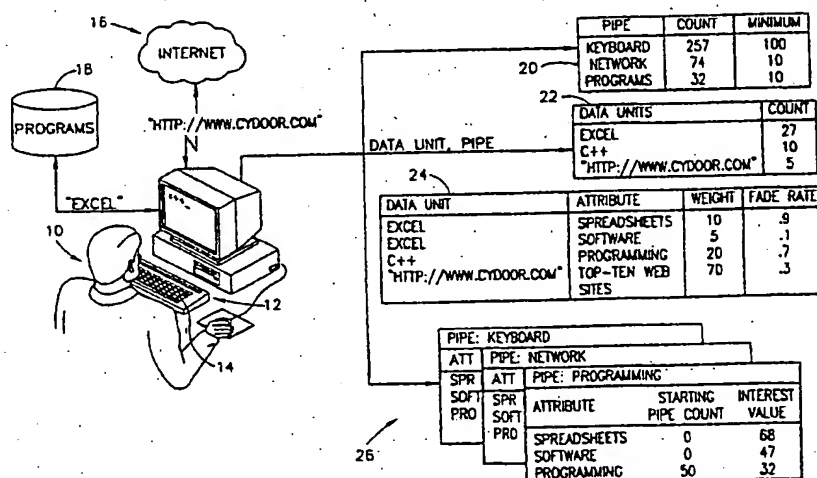
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(54) Title: METHODS AND APPARATUS FOR TRACKING AND RATING COMPUTER USER BEHAVIOUR



- (57) **Abstract:** A method for tracking computer user (10) behavior comprising providing at least one pairing comprising an attribute (24) and a data unit (22), monitoring a computer user (10) interaction via at least one pipe (20) to identify at least one data unit (22) resulting from the interaction, determining a correlation between the attribute (24) and the data unit (22), and adjusting an interest value (26) associated with the pipe (20) and the attribute (24) to reflect said correlation.

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## METHODS AND APPARATUS FOR TRACKING AND RATING COMPUTER USER BEHAVIOUR

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### FIELD OF THE INVENTION

The present invention relates to data processing in general, and in particular to methods and apparatus for tracking and rating computer user behavior based on computer use.

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### BACKGROUND OF THE INVENTION

Various methods are known for tracking computer a computer user's usage of a computer. Typically, a user's keyboard and other inputs are recorded in a file on the user's computer or on a server that the user accesses. These inputs may then be analyzed and used for targeted advertising. Existing methods generally require a great amount of storage and do not track user behavior patterns over time.

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### SUMMARY OF THE INVENTION

The present invention seeks to provide novel apparatus and methods for tracking and rating computer user behavior based on computer use. The present invention provides an improved system which overcomes the known disadvantages of the prior art as discussed above. A system is provided where computer user behavior is tracked over time in multiple categories based on various user input pathways. User behavior is periodically summarized and reported to a computer server which provides

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targeted information, such as advertising, to the user appropriate to the user's reported behavior.

There is thus provided in accordance with a preferred embodiment of the present invention a method for tracking computer user behavior, the method includes providing at least one pairing comprising an attribute and a data unit, monitoring a computer user interaction via at least one pipe to identify at least one data unit resulting from the interaction, determining a correlation between the attribute and the data unit, and adjusting an interest value associated with the pipe and the attribute to reflect the correlation.

Further in accordance with a preferred embodiment of the present invention, the method also includes maintaining a count of the data units, wherein the pairing has an associated weight value and fade rate, and wherein the adjusting step comprises adjusting according to the formula:

$$\text{interest value} = \text{interest value} + (\text{weight} * \text{fade rate}^{\text{data unit count}}).$$

Additionally in accordance with a preferred embodiment of the present invention, the method further includes maintaining a pipe count for counting data units encountered at the pipe and a pipe minimum count for the pipe, maintaining a starting pipe count for the attribute and the pipe, and calculating an adjusted pipe attribute interest value by dividing the interest value by the difference between the pipe count and the starting pipe count where the pipe count is greater than or equal to the pipe minimum. Preferably the method also includes calculating a consolidated attribute interest value for the attribute by summing each of the adjusted pipe attribute interest values associated with the attribute.

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Still further in accordance with a preferred embodiment of the present invention, the method also includes maintaining a plurality of attribute scales for the attribute, each of the plurality having an associated weight and a reference value, and correlating one of the plurality with the attribute by multiplying for each of the plurality the weight by the absolute difference between the reference value and the consolidated attribute interest value to yield an attribute score, and determining which of the plurality yields a lowest one of the attribute scores.

There is also provided in accordance with a preferred embodiment of the present invention a method of providing information to a user including the steps of: determining an attribute scale corresponding to a behavior attribute for the user, correlating the attribute scale to at least one computer file having a predefined association with the attribute scale, and providing the computer file to the user.

#### BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be understood and appreciated from the following detailed description, taken in conjunction with the drawings in which:

Fig. 1 is a simplified semi-pictorial semi-block illustration of a computer user behavior tracking system constructed and operative in accordance with a preferred embodiment of the present invention;

Figs. 2A and 2B, taken together, are simplified flowchart illustrations of a preferred method of operation of the system of Fig. 1 in data unit gathering mode;

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Fig. 3 is a simplified semi-pictorial semi-block illustration of aspects of the computer user behavior tracking system of Fig. 1 constructed and operative in accordance with a preferred embodiment of the present invention;

Fig. 4 is a simplified flowchart illustration of a preferred method of operation of the system of Figs. 1 and 3 in attribute scale mode; and

Fig. 5 is a simplified semi-pictorial semi-block illustration of a system for providing information to a user based on the user's behavior as tracked by the system of Fig. 1 constructed and operative in accordance with a preferred embodiment of the present invention.

#### DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Reference is now made to Fig. 1 which is a simplified semi-pictorial semi-block illustration of a computer user behavior tracking system constructed and operative in accordance with a preferred embodiment of the present invention. Fig. 1 shows a computer user 10 operating a computer 12, being any known computer. Computer 12 is shown as typically having a keyboard 14, a network connection 16, such as to the Internet 17, and a program storage 18 for storing software applications.

A "pipe" is defined herein as a logical pathway via which a computer user interacts with a computer, whereas a "data unit" is defined as the object of an interaction via the pipe. Examples of pipes may include keyboard input, web sites a user accesses, software application that a user uses, data files that the user has created, and others. Thus, in Fig. 1 keyboard 14 provides the pipe "keyboard input" via which user 10 enters a data unit such as the typed word "C++". Similarly, network connection 16 provides the

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pipe "network activity" via which user 10 retrieves a web page at "http://www.cydoor.com," being the data unit, and program storage 18 provides the pipe "programs" via which user 10 executes a program such as "EXCEL," being the data unit. An "attribute" is defined herein as a classification of data units that is typically independent of any pipe. Thus the data unit "EXCEL" may be classified both under the attribute "software" as well as under the attribute "spreadsheets."

A pipe table 20 is typically maintained by computer 12 where a count is kept of the number of data units encountered for each pipe, referred to herein as the "pipe count," as well as a minimum count used to determine the usefulness of the data unit count for the pipe, referred to herein as the "pipe minimum." A data unit table 22 is typically maintained by computer 12 where a count is kept of the number of times each data unit is encountered, referred to herein as the "data unit count". An attribute table 24 is typically maintained by computer 12 indicating which data units belong to which attributes and includes a weight and fade rate for each attribute/data unit combination. referred to herein as the "attribute weight" and the "attribute fade rate" respectively. An interest value table 26 is typically maintained by computer 12 where a starting pipe count and interest value are kept for each attribute. Preferably, a separate one of interest value table 26 is kept for each pipe, where the starting pipe count for each pipe/attribute is set equivalent to the pipe count of the corresponding pipe when tracking begins for the attribute. Typically, separate ones of tables 20, 22, and 26 are maintained for predetermined time periods, such as for one month each.

Typical operation of the system of Fig. 1 is now described with additional reference to Figs. 2A and 2B which, taken together, are simplified flowchart illustrations

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of a preferred method of operation of the system of Fig. 1 in data unit gathering mode. Computer 12 is preferably adapted to implement the method of Figs. 2A and 2B as described in detail hereinbelow, as well as other methods described herein, through the use of specialized software and/or hardware designed for that purpose using well-known techniques. Where software is employed it may be installed into computer 12 from magnetic storage media using well-known techniques, or downloaded to computer 12 via network connection 16. Computer 12 is preferably preconfigured with attribute table 24 containing a list of attribute/data unit pairings, using any of the installation techniques described hereinabove.

In the method of Fig. 2A the pipe count in pipe table 20, the data unit count in data unit table 22, and the starting pipe counts and interest values in interest value tables 26 are initialized at the start of the current period, typically being set to 0. During the course of a tracking period, user 10 interacts with computer 12 by providing a data unit via one of the pipes in the manner described hereinabove with reference to keyboard 14, network connection 16, and program storage 18. The pipe count of the pipe via which the data unit has been received is incremented in pipe table 20. Data unit table 22, typically preconfigured with computer 12 or derived from attribute table 24, is then searched to determine whether the data unit entered is a known data unit, and, if so, the corresponding data unit count in table 22 is incremented. Attribute table 24 is then searched to determine the attributes, weights, and fade rates associated with the data unit. The interest value in interest value table 26 for the pipe and attribute corresponding to the data unit is then increased, preferably using the following formula:

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$$\text{interest value} = \text{interest value} + (\text{weight} \times$$

fade rate<sup>data unit count</sup>)

where the weight and fade rate are those found in attribute table 24 corresponding to the attribute/data unit pairing.

5        Operation of the system of Fig. 1 continues in Fig. 2B. The method of Fig. 2B is typically performed at the end of each period, although it may be performed at any time. For each pipe, preferably where the pipe count is greater than or equal to the pipe minimum (table 20), an adjusted pipe attribute interest value may be calculated by dividing the interest value for each attribute (table 26) by the difference between the pipe  
10        count (table 20) and the starting pipe count for the attribute (table 26). The result may be multiplied by a multiplier to reduce the fraction of the result, if desired. A consolidated attribute interest value for an attribute may be calculated by summing each of the adjusted pipe attribute interest values associated with the attribute.

      Additional reference is now made to Fig. 3 which is a simplified semi-pictorial  
15        semi-block illustration of aspects of the computer user behavior tracking system of Fig. 1 constructed and operative in accordance with a preferred embodiment of the present invention. An attribute scale table 28 is typically maintained by computer 12 and includes one or more attribute scales for each attribute. Each attribute scale represents a degree and/or pattern of interest which a user may hold for an attribute. Attribute  
20        scale table 28 typically includes one or more attribute scale identifiers, such as a number, as well as a weight and a reference value which may be used to classify an attribute according to a particular attribute scale as is now explained with additional



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reference to Fig. 4 which is a simplified flowchart illustration of a preferred method of operation of the system of Figs. 1 and 3 in attribute scale mode.

In Fig. 4 an attribute score is preferably derived for an attribute for each attribute scale by multiplying each attribute scale weight by the absolute difference  
5 between the attribute's attribute scale reference value and the consolidated attribute interest value (Fig. 2B). The attribute scale which yields the lowest attribute score for a given attribute is preferably chosen to represent the interest which the user holds for the attribute.

Where attribute information is gathered during predefined time periods  
10 separate attribute scale weights and reference values may be maintained for each period. A consolidated attribute score for multiple periods may be calculated by summing the attribute scores of each attribute/period calculated as above to yield the lowest consolidated attribute score and thus arrive at the attribute scale number to represent the interest which the user holds for the attribute.

15 Reference is now made to Fig. 5 which is a simplified semi-pictorial semi-block illustration of a system for providing information to a user based on the user's behavior as tracked by the system of Fig. 1 constructed and operative in accordance with a preferred embodiment of the present invention. In the system of Fig. 5 computer 12 reports to a server 30, typically via the Internet 17, each attribute and scale derived as  
20 described hereinabove. Computer 12 may report this information according to a predetermined schedule or upon computer 12's self initiative or upon request from server 30. Server 30 preferably maintains an information mapping table 32 where attributes and scales serve to identify appropriate information to be sent to computer 12.

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For example, the attribute "programming" having a reported attribute scale of "00" may indicate that a particular advertising campaign be provided to computers reporting such an attribute and scale combination. Server 30 may then retrieve computer files appropriate to the campaign, such as graphic advertising banners, from a storage 34, and send them to computer 12 where they may be provided to user 10, such as in the form of a display element 36.

It will be appreciated by persons skilled in the art that the present invention is not limited by what has been particularly shown and described hereinabove. Rather the scope of the present invention includes both combinations and subcombinations of the features described hereinabove as well as modifications and variations thereof which would occur to a person of skill in the art upon reading the foregoing description and which are not in the prior art.

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## CLAIMS

What is claimed is:

1. A method for tracking computer user behavior, the method comprising:  
providing at least one pairing comprising an attribute and a data unit;  
monitoring a computer user interaction via at least one pipe to identify at least one data unit resulting from said interaction;  
determining a correlation between said attribute and said data unit; and  
adjusting an interest value associated with said pipe and said attribute to reflect said correlation.
2. A method according to claim 1 and further comprising maintaining a count of said data units, wherein said pairing has an associated weight value and fade rate, and wherein said adjusting step comprises adjusting according to the formula:  
$$\text{interest value} = \text{interest value} + (\text{weight} * \text{fade rate}^{\text{data unit count}}).$$
3. A method according to claim 2 and further comprising:  
maintaining a pipe count for counting data units encountered at said pipe and a pipe minimum count for said pipe;  
maintaining a starting pipe count for said attribute and said pipe; and  
calculating an adjusted pipe attribute interest value by dividing said interest value by the difference between said pipe count and said starting pipe count where said pipe count is greater than or equal to said pipe minimum.
4. A method according to claim 3 and further comprising calculating a consolidated attribute interest value for said attribute by summing each of said adjusted pipe attribute interest values associated with said attribute.
5. A method according to claim 4 and further comprising:

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maintaining a plurality of attribute scales for said attribute, each of said plurality having an associated weight and a reference value; and

correlating one of said plurality with said attribute by:

    multiplying for each of said plurality said weight by the absolute difference between said reference value and said consolidated attribute interest value to yield an attribute score; and

    determining which of said plurality yields a lowest one of said attribute scores.

6. A method of providing information to a user comprising:  
    determining an attribute scale corresponding to a behavior attribute for said user;  
    correlating said attribute scale to at least one computer file having a predefined association with said attribute scale; and  
    providing said computer file to said user.
7. A method substantially as described hereinabove.
8. A method substantially as illustrated in any of the drawings.
9. Apparatus substantially as described hereinabove.
10. Apparatus substantially as illustrated in any of the drawings.

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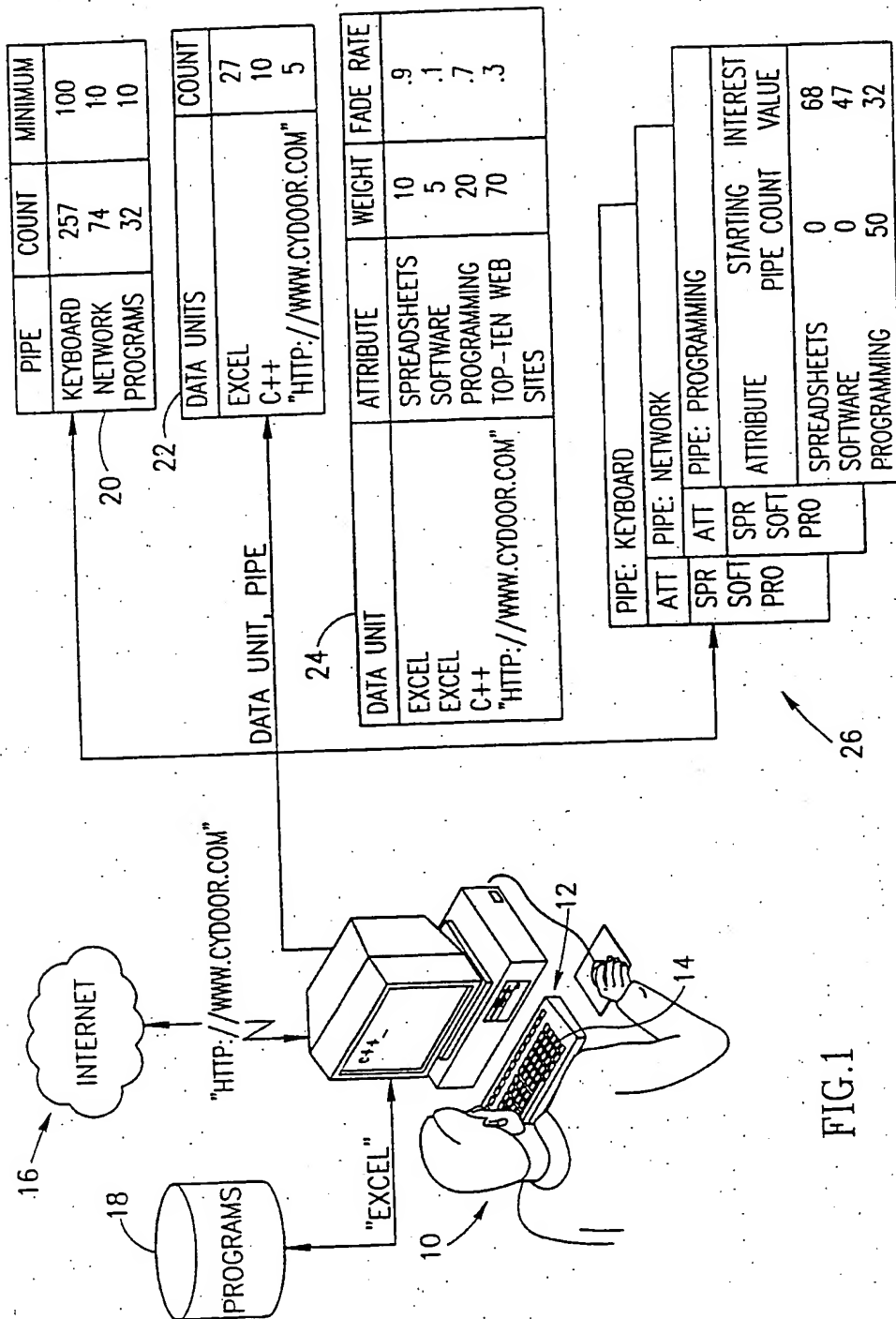


FIG.1

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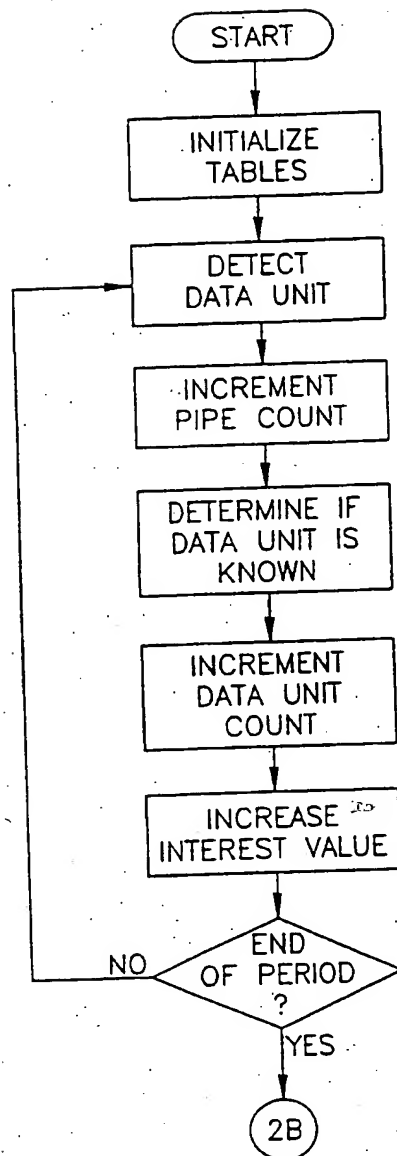


FIG. 2A

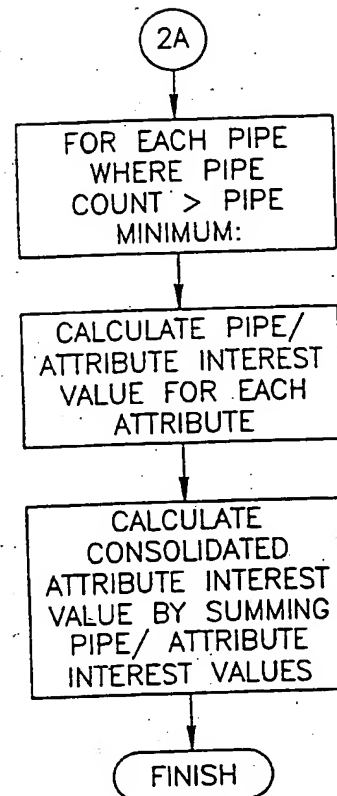


FIG. 2B

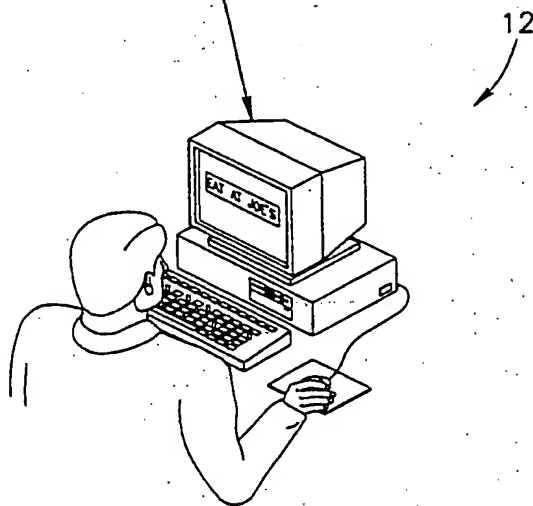
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FIG.3

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ATTRIBUTE: PROGRAMMING				
PERIOD (e.g. MONTH)	SCALE IDENTIFIER	DESCRIPTION	REFERENCE VALUE	WEIGHT
1	00	NOT INTERESTED	0	1
1	01	INTERESTED	50	1
1	10	VERY INTERESTED	100	1
1	11	WASNT, NOW IS INTERESTED	0	1
2	11	NOT INTERESTED	0	1
2	01	INTERESTED	50	1
2	10	VERY INTERESTED	100	1
2	11	WASNT, NOW IS INTERESTED	100	1



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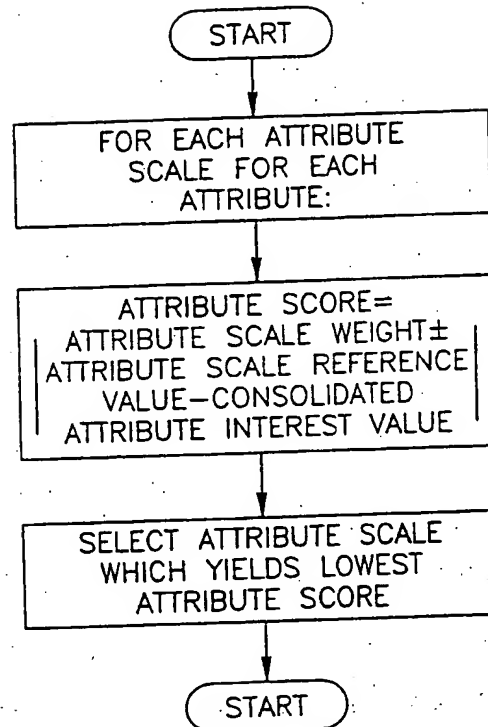
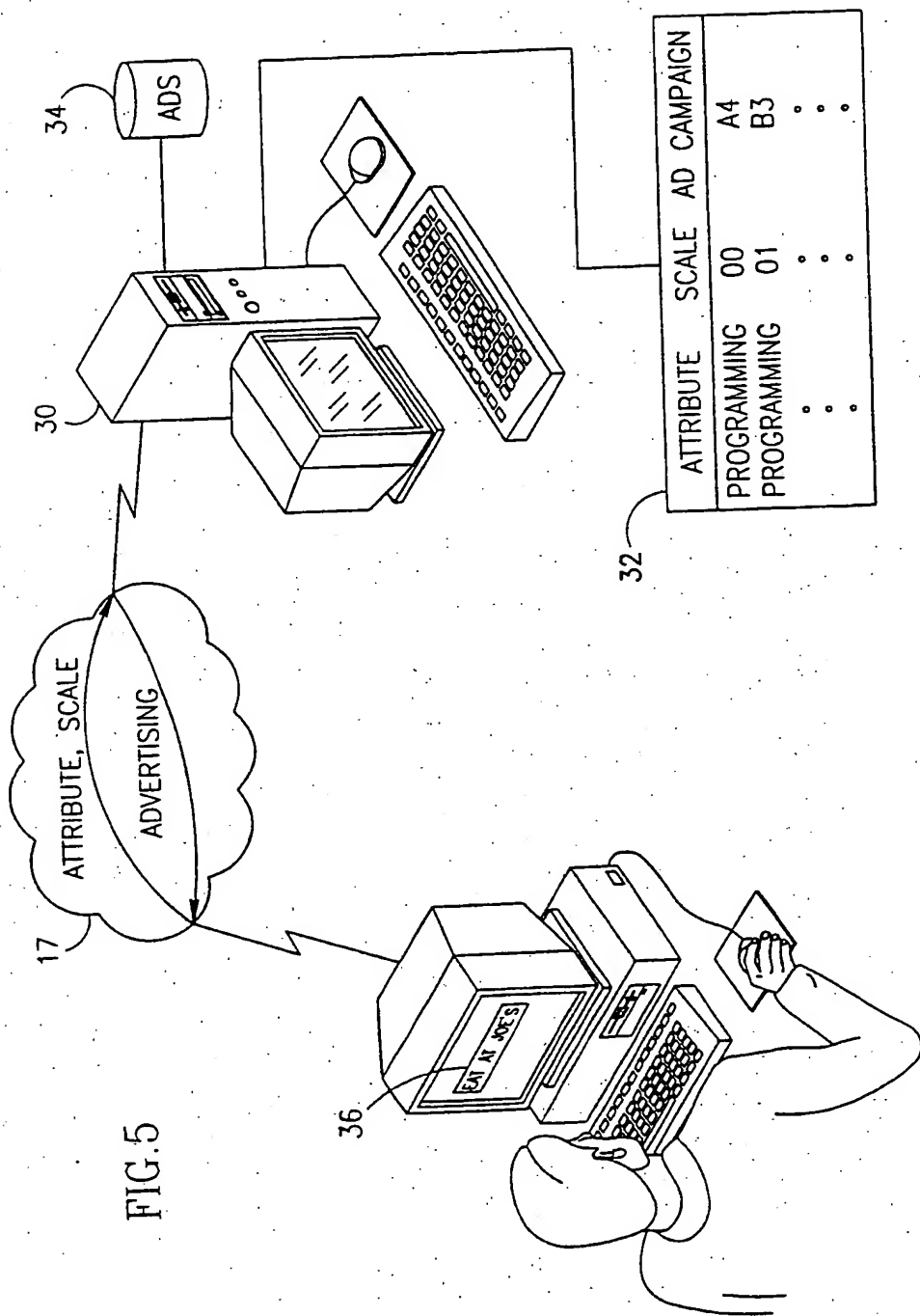


FIG.4



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# INTERNATIONAL SEARCH REPORT

International application No.  
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<b>A. CLASSIFICATION OF SUBJECT MATTER</b> IPC(7) : G06F 17/60 US CL : 705/14; 709/224, 226 According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b> Minimum documentation searched (classification system followed by classification symbols) U.S. : 705/14; 709/224, 226 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched NONE Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) WEST, DIALOG		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,675,510 A (COFFEY et al) 07 October 1997, col. 5, line 6 thru col. 9, line 45.	6-10
X,P	US 6,018,619 A (ALLARD et al) 25 January 2000, col. 9, line 10 thru col. 18, line 11.	6-10
A	US 5,712,979 A (GRABER et al) 27 January 1998, entire document.	1-10
A	US 5,796,952 A (DAVIS et al) 18 August 1998, entire document.	1-10
A	US 5,867,205 A (HARRISON) 02 February 1999, entire document.	1-10
A	US 5,878,384 A (JOHNSON et al) 02 March 1999, entire document.	1-10
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I national application No.  
PCT/IL00/00361

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A,P	US 5,949,415 A (LIN et al) 07 September 1999, entire document.	1-10
A,P	US 5,977,964 A (WILLIAMS et al) 02 November 1999, entire document.	1-10

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